REMARKS

This amendment is responsive to the official action of February 10, 2003 (Paper No. 6), wherein claim 7 was considered indefinite under 35 U.S.C. §112, second paragraph; claims 1-5 were rejected as obvious from a proposed combination of Berssen (US 5386287) and Fann (US 6279828); and claim 6 was rejected as obvious from the combination of Berssen and Fann, plus Barker (US 4900513).

The claims have been amended to more particularly and distinctly define the subject matter regarded as the invention and to better distinguish from the prior art of record. No new matter is presented. The differences between the invention as now claimed, and the references of record, are such that the subject matter claimed as a whole is not shown to have been known or obvious. Therefore, the claims as amended are allowable as now presented. Reconsideration and allowance are requested.

Claim 7 has been canceled, without prejudice. A new independent claim 8 is added, defining the method of the invention. The number of claims remains within the number for which filing fees already have been paid.

As described in applicant's specification, there are problems in automatic identification arrangements that seek to label blood test cuvettes, for example, because the structure of the cuvette is small and curved (cylindrical). An elongated bar code (i.e., a one dimensional string of bar code characters) can be wrapped around the circumference of the flange at the top end of the cuvette, but unless the code is short, the code extends around the sides of the cuvette, and is foreshortened in elevation view, to the extent that scanning is difficult or impossible. However is it advantageous for the code to have a length sufficient to encode a large number of distinct cuvette identities and/or to contain other information such as parity check digits and the like.

Applicant has improved such an arrangement so that the bar code label can be shorter, namely, so that a code having fewer digits can encode at least an equally large

number of distinct data values, as a comparable conventional code using more digits. This is accomplished by providing a reader that is operable with, and responsive to, at least two different variations of the control codes embedded in the lines and spaces of the bar code. According to an inventive aspect, the start codes and/or stop codes that begin and end a string of bar code characters, are provided in two or more (and preferably four) variations. The distinctions between the control codes provide additional data for distinguishing between the information codes that are provided between the control codes. In this way the bar code is linearly shorter (i.e., it uses fewer characters) to encode the same number of data values. For example, it may require two decimal digits to encode 100 distinct values. If there are also two different start codes that are operable and detectable by the reader, the same two decimal digits encode 200 distinct values because the start code variation adds a binary modulus.

These aspects of the invention are particularly and distinctly claimed, and are neither disclosed nor suggested in the prior art of record. There is no teaching or suggestion that one can squeeze additional data out of a given number of characters by modifying the reader to read and respond to variations in the control codes.

Claims 1-5 were rejected over Berssen and Fann. Berssen discloses the combination of a vial and a barcode label 8. However Berssen simply underscores the problem. The bar code is too long to appear readably in an elevation view of the vial. The bar code is foreshortened by wrapping around the vial. As a result, Berssen teaches that the vial must be carried in a rotating device 2 when read. See col. 3, lines 4-12. Berssen teaches away from applicant's claimed the invention, and teaches away from the combination with Fann that the examiner has proposed, by providing a technique to read a number of sequential bar code characters that extend clear around the circumference of the vial.

Berssen is cited in combination with Fann. The examiner points out that Fann teaches bar code having a start code and a stop code. The examiner asserts that it would be routine matter to modify Berssen to include a start code and stop code so as to read Berssen's code (presumably while rotating the vial). Even assuming that the examiner is correct in the conclusion that Fann supports providing start codes and stop

codes in Berssen, there is no teaching or suggestion in the proposed combination that leads routinely to the concept of providing plural kinds of start codes, plural kinds of stop codes and/or other variants in control codes, that can be distinguished as a form of datum that adds to the number of bits or distinct values that can be encoded by a given number of information characters.

Fann conventionally uses a given start code and a given stop code, each of which is a very specific pattern, and is used in that one specific pattern to operate the reading device. Therefore, Fann fails to disclose or suggest applicant's invention claimed as a whole.

Assuming that Berssen doesn't already use some sort of begin/end marker, if Berssen and Fann are combined, the routine result is that Fann's start and stop codes render Berssen's bar code even longer that it is already. Although the proposed combination might be possible, there is no question that it leads the person of ordinary skill away from the applicant's development of a way to obtain a shorter bar code, namely a bar code in which the number of successive digits can be reduced by squeezing more data variations out of the number of characters that are already provided.

According to Fann's specification, one of the main objects of mapping of bar code variations to data values is to provide for a large number of possible data variations. Fann points out that the Code 128 bar code standard encodes only 106 characters and that it would be advantageous to encode more. However Fann simply maps more of the possible combinations of bars and spaces in a bar code to valid data values. This does not teach or suggest providing more possible combinations than a code is capable of encoding, which is what applicant has accomplished by using additional bits, outside of those combinations, produced by providing for selection and use of two or more alternative but fully operable control codes.

The number of variations that can be encoded is a mathematical determinant. In a common form of bar code, for example, there is a possible modulus of four (light, dark, broad, narrow), which is possibly complicated by the requirement of a fixed length, for example, but with a given number of bands is capable of encoding only a finite and

constant number of different variations. It is possible that a code may use all the possible combinations. For example, four bit hexadecimal 0 to 9 and A to F encodes all the possible values of four binary bits. But using all possible combinations is not mandatory. The code might use only a subset of the available combinations. For example, binary coded decimal 0 to 9 also requires four bits but encodes just ten possible values. This sort of distinction in the number of combinations mapped, is the subject of Fann. There is no disclosure or suggestion in Fann, however, to teach the person of ordinary skill who is subject to the limitation of using a code that has a given number of possible variations, how to multiply that number of variations by the number of distinct supported kinds of start codes and/or stop codes.

In applicant's example, a two digit decimal information part of the code is described (see paragraph 66) to provide 100 variations. That is enough for the 96 cuvettes provided in the supplier's box, but it requires four or five bar code characters. Assuming a one digit start character, a one digit stop character and a checksum character, five characters are needed. However, according to the invention, by using four variations of start codes and four of stop codes, not only do you get 160 variations, but at the same time you can reduce the number of decimal digits used for the information part of the code, to one single digit. It is one aspect of the invention to provide a larger number of variations, but it is also a most important aspect of the invention to limit the length of the bar code so that it is more readily possible to encode and scan values on very small cuvettes.

The prior art fails to teach or suggest the invention claimed as a whole. Therefore, claims 1-5 are allowable as now presented.

Claim 6 further recites the invention in connection with a box of cuvettes. Claim 6 has been placed in independent form and incorporates the subject matter of claim 1 as amended and former dependent claim 6. Claim 6 is allowable for the same reasons as claim 1.

Claim 6 was rejected over the basic combination of Berssen and Fann, plus Barker. Barker's Fig. 1 shows a bar coded box for ten items, mentioned at col. 6, line 6. However, Barker does not provide any teachings that would lead the person of ordinary

skill to supply the teachings missing from Berssen and Fann or to even consider problems related to the size and number of characters in a bar code versus the number of possible variations that can be encoded. Barker, like Berssen and Fann, fails to teach or suggest providing plural detectable variations of control codes such as the start code and the stop code, as a technique to manage cuvettes.

New claim 8 defines the method steps as described, including providing a code that comprises data between start and stop codes (ID data); selecting and using at least one code from among a plurality of start/stop codes of different values; and using both the ID data between the start/stop codes, and also the value of one (or both) of the start/stop codes, to provide an identification code. This subject matter is not found or suggested in the prior art of record.

It might be possible to envision multi-format bar code reader that uses differences in the start and stop code types to inform the reader as to whether the information part of the bar code is in one format (e.g., Code 128) versus another. That possibility likewise fails to disclose or suggest the idea of squeezing more data capacity out of a bar code than the bar code conventionally has, by providing distinct start/stop control code values that are received as data bits contributing to the information value. The prior art of record would not lead a person of ordinary skill routinely to the invention claimed as a whole, and instead would cause the person of ordinary skill to try ways to read elongated code on a small labeled item (spinning the vial in Berssen) or to seek to expand the number of code variations carried in the information characters part (remapping as in Fann) apart from any variation of the control codes.

Every effort has been made to amend the claims to particularly and distinctly define the invention. The claims as amended are definite. The differences between the invention and the prior art are such that the subject matter claimed as a whole is not shown to have been known or obvious.

Reconsideration and allowance of the pending claims are requested.

Respectfully submitted,

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CUVETTE CONTROL UNIT AND CONTROLLING METHOD USING THE SAME

BACKGROUND OF THE INVENTION

[0001] This invention relates to a unit for controlling cuvettes ~~to be~~ used ~~at the time of~~when counting ~~number of leukocyte mixed~~leukocytes in blood products.

[0002] ~~At the time of~~When counting the number of ~~leukocyte mixed~~leukocytes in blood products, it is ~~necessary~~known to mix the blood products ~~and~~with a hemolysis fluorescent dyeing reagent ~~with each other so as to react in a conventional method~~. FIG. 1 is a view ~~for~~ showing a cuvette ~~(a container for measurement)~~, (a) ~~is~~being a side view and (b) ~~is~~being a view seen from arrow A of (a). AThe cuvette ~~1, which~~1 is ~~the~~a container for ~~inserting~~holding blood products ~~and~~with the reagent therein, during measurement. Cuvette 1 has a hollow main body 2 made of colorless~~, and~~ transparent plastic and a colored lid 3 made of rubber, as shown in FIG. 1. The main body 2 is open on ~~the upper hand~~top, and its opening portion ~~is~~has an installation portion 2d ~~of~~for the lid 3. The lid 3 is attachably and detachably installed on this installation portion 2d. ~~On the lower side of~~Below the installation portion 2d of the main body 2, a body portion 2c in a cylindrical shape is formed ~~on its center portion, and the side lower than~~. Below the body portion 2c is a taper portion 2b. ~~With~~At the lower end of the taper portion 2b, a plate portion 2a is provided. The whole main body 2 and the plate portion 2a are formed ~~so as to unit with each other, and the~~integrally. The whole has a shape like a cone ~~facing the lower~~narrowing downwardly. The lid 3 is inserted into the installation portion 2d, and the installation portion 2d is a cylindrical shape having the diameter bigger than one of the body portion 2c so as not to drop the lid 3 ~~in~~into the body portion 2c.

~~[0003] At the time of~~For ~~counting number of leukocyte mixed~~leukocytes ~~in~~ blood products using the above-mentioned cuvettes 1, ~~ninety six (96), for instance,~~a number of empty one-use cuvettes 1 ~~for exclusive use are taken out of~~(for example 96 cuvettes) are provided in a cuvette box, and are taken individually and identified by marking an ID number ~~is entered~~ on the main body 2 of ~~all~~each of the cuvettes 1 with a marking ink ~~so as to identify. And, a~~. A unique ID number is affixed on blood products bag when blood is collected~~, and the~~. The blood products ID and the cuvette ID are ~~corresponded to~~

~~each other and the correspondence is entered~~ correlated by entries in a note book or the like.

[0004] Subsequently, 100 ~~.mu.L~~μL of hemolysis ~~.TM.~~™ fluorescent dyeing reagent, for instance, is respectively added to the ninety six (96) cuvettes 1. Thereafter, 100 ~~.mu.L~~μL of the blood, for instance, is extracted from the blood products, and the extracted blood is added to the cuvette ~~1 which~~1, wherein the reagent ~~is in so as to~~and the blood mix and react. The above-mentioned operation is repeated for each of the ninety six cuvettes 1 in order. Thereafter, the cuvette 1 in which the reagent and the blood products are reacted is taken out ~~so as to centrifuge. And~~and centrifuged. Then, the cuvette 1 is taken out of the ~~centrifugal so as to~~ centrifuge and set on a micro-leukocytometer.

[0005] ~~On~~At this ~~occasion~~point, it is necessary ~~to~~ manually to input the blood products ~~ID~~identification in the micro-leukocytometer. In this machine, laser beams are exposed to the ~~leukocyte staying on~~leukocytes at the lower ~~hand~~end of the cuvette 1, and the image is analyzed with a CCD camera or the like from the lower ~~hand~~end or from the side ~~hand~~ so as to count the number of ~~the leukocyte~~leukocytes. The counted result is displayed, ~~corresponding to~~correlated with the input blood products ~~ID~~identification, and ~~is~~ printed or ~~is~~ stored in a memory medium.

[0006] In a conventional method of controlling cuvettes, it is necessary for a tester to ~~enter ID~~read the identification number ~~on~~from each of the cuvettes 1 and to enter ~~the correspondence between~~ the cuvette ID and~~number against~~ the blood products ID ~~on another place. But, the enter of numbers~~number in a separate list, so as to establish the correspondence between these numbers. But this is a close operation ~~since~~because the cuvette 1 is about 30 mm in ~~whole~~total length and ~~the~~has a maximum diameter ~~is~~of about 18 mm, for instance~~, so it~~. The cuvette is small. Besides, ninety six (96) ~~times of entry is necessary for~~cuvette ID number entries must be made to complete one box, and ninety six (96) ~~times of correspondence of ID number is~~correlations of cuvette and blood product ID numbers are also necessary. ~~Information,~~The ID numbers may encode information such as the blood center, the place where the blood ~~is~~was collected, and a serial number ~~is included,~~ in the blood products ID~~, and this~~. This ID is

a 10 ~~digits~~digit number. As mentioned before, the blood products ID is manually input ~~in~~at a measuring instrument. There are ~~some~~ problems ~~during the above-mentioned~~in such an operation, for instance, there is a possibility of error ~~operation, and a~~. In any event, the tester ~~strongly feels~~is subject to strong mental stress and physical pain.

[0007] For these reasons, each cuvette 1 ~~is~~might be controlled using bar ~~code to be~~codes of the sort used for individual data control in ~~another field~~other fields. But~~,~~ the cuvette 1 is small~~, as mentioned before~~. For this reason, the ~~size of the place~~area where a bar code ~~is affixed is limited. So, the problem wherein~~might be affixed is small.There are problems if one attempts to affix and use conventional bar code ~~can not be affixed as it is exists~~.

[0008] ~~Then, the~~An object of the present invention is to provide a cuvette control unit capable of controlling cuvettes 1 ~~with~~by using bar code even ~~if~~though the cuvette is small and the ~~size of the place where~~area for affixing a bar code ~~is affixed~~ is limited.

SUMMARY OF THE INVENTION

[0009] ~~The invention of claim 1 is~~According to an inventive aspect, a cuvette control unit is provided for controlling cuvettes by reading a first bar code affixed on said cuvette, said first bar code being comprised of ~~codes for controlling~~control code characters located on ~~both~~opposite end portions, and ~~code for~~ information codes located between said control codes ~~for controlling, said~~. The cuvette control unit ~~comprising: [0010]~~ comprises: a first reading means capable of reading said first bar code; ~~[0011]~~ a cuvette identification information producing means for producing cuvette identification information corresponding to said cuvette on which said first bar code is affixed from said control code ~~for controlling~~characters and said ~~code for~~ information codes of said first bar code read by said first reading means; and ~~[0012]~~ a memory means for storing said cuvette identification information produced by said cuvette identification information producing means, corresponding to said cuvette on which said first bar code is affixed.

[0013] According to ~~the present invention relating to claim 1, the identification information of a cuvette is produced from codes for controlling located on both end portions of the first bar code and the code for information located between said codes for controlling, and the identification information of the cuvette is stored by the memory means, corresponding to the cuvette. Then~~an inventive aspect, the capacity of the identification information ~~of~~on the cuvette ~~can be~~is increased ~~according to the number of kinds of the codes for controlling with~~because a number of different kinds of control codes are used and can distinguish between identification codes that otherwise have the same digits of ~~code for~~ information code between said control codes. Therefore, ~~the~~sufficient capacity of the identification information is obtained for identifying the cuvettes ~~can be sufficiently obtained even if one digit is decreased in comparison with~~. In fact, the information capacity encoded by a given number of code digits is increased (or the necessary number of digits to encode the same information is decreased) as compared to the number of digits of information code ~~for~~and/or information ~~having~~capacity of a general bar code of comparable size and/or capacity. That is, identification and control of cuvettes are possible with ~~the bar code having~~ smaller bar code, having fewer digits, than a general bar code.

[0014] ~~The invention of claim 2 is the cuvette~~According to one application of this aspect, the control ~~unit as set forth in claim 1, wherein said cuvette identification information producing means produces said cuvette identification information corresponding to said cuvette on which said first bar code is affixed from start code of said codes for controlling and said code for information. [0015] According to the present invention relating to claim 2, the identification information is produced from the start code of the codes for controlling and the code for information of the first bar code such that the capacity of the identification information of the bar code, wherein digit of the code for information is the same, can be~~codes used in said first bar code comprise a start code that has at least two distinct kinds. Identification information is encoded by the kind of start code used in the control code. When this control code distinction is used in the first bar code together with information code, the information capacity of the first bar code is increased according to the number of kinds of the start code~~, and more~~.

More cuvettes ~~than a general bar code~~ can be identified and controlled than in a general bar code having the same number of digits.

[0016] ~~The invention of claim 3 is the cuvette control unit as set forth in claim 1, wherein said cuvette identification information producing means produces said cuvette identification information corresponding to said cuvette on which said first bar code is affixed from~~ Alternatively or in addition, said first bar code can have two or more distinct kinds of stop code ~~of said codes for controlling and said code for information. [0017] According to the present invention relating to claim 3, the identification information is produced from the stop code of the codes for controlling and the code for information of the first bar code such that~~ used in the control codes. As described above with respect to having distinct start codes as control codes, the capacity of the identification information of the bar code~~, wherein digit of the code for information is the same,~~ can be increased according to the number of distinct kinds of the stop code. Given the same number of digits of information code plus these distinct kinds of control codes, ~~and~~ more cuvettes ~~than a general bar code~~ can be identified and controlled.

[0018] ~~The invention of claim 4 is~~ In one embodiment, the cuvette control unit ~~as set forth in claim 1, wherein said~~ and cuvette identification information producing means ~~produces said cuvette~~ uses identification information ~~corresponding to~~ for said cuvette ~~on which~~, namely said first bar code ~~is~~ affixed ~~from start code of said codes for controlling and stop code of said codes for controlling and said code for information. [0019] According to the present invention relating to claim 4,~~ thereto, with start code as one control code and a stop code as another control code. Part of the identification information is produced from the control codes, particularly a start code and ~~the stop code of the codes for controlling and the code for information of the first bar code such that the capacity of the identification information of the bar code, wherein digit of the code for~~ a stop code. The number of distinct identification values possible with bar code containing multiple kinds of start codes and multiple kinds of stop codes, wherein the number of digits of information code between the control codes is the same, ~~can be~~ is increased according to the number of kinds of the start code and the stop code~~, and further more cuvettes than a general bar code can be identified and~~

~~controlled~~. For instance, ninety six (96) cuvettes, which are generally used, can be identified and controlled even with one digit of ~~code for~~ information code.

[0020] The ~~invention of claim 5 is the cuvette control unit as set forth in claim 1, whereinincreased~~ formation capacity provided in this way can be used for additional purposes. For example, said first bar code ~~is~~can be comprised of ~~said~~control codes ~~for controlling comprised~~comprising multiple kinds of start code and stop code, one digit of ~~said code for~~identifying information code and one digit of ~~code for~~ inspection code.

[0021] ~~According to the present invention relating to claim 5, the~~In this embodiment, cuvettes can be identified and controlled with four digits ~~of bar code since the~~or characters. The cuvette identification information can be obtained by the first bar code comprised of control codes ~~for controlling~~ comprised of the start code and the stop code, one digit of code for information ~~and one~~, plus said digit of ~~code for~~ inspection. ~~Then, the~~ code. Althoughthe bar code ~~can~~may be affixed to ~~the~~a cuvette ~~wherein~~and the ~~size of~~area for the bar code label ~~to be affixed~~ is limited, ~~so~~ the cuvettes can be identified and controlled.

[0022] The invention ~~of claim 6 is the cuvette control unit as set forth in claims 1 through 5 for controlling~~accommodates the fact that a plurality of said cuvettes are stored in a cuvette box ~~on which a~~. A second bar code is affixed~~, wherein a~~ on the box. A second reading means is capable of reading said second bar code ~~is provided, a~~. A cuvette box identification information producing means ~~for producing cuvette~~produces box identification information corresponding to ~~said~~the cuvette box~~, on which said~~ carrying the second bar code ~~is affixed, from said second bar code read by said second reading means is provided, and a~~. A storing control means ~~for storing~~stores said cuvette identification information corresponding to the individual cuvettes, and said cuvette ~~stored in said cuvette box, on which said second bar code is affixed, read by said second reading means, produced by said cuvette identification information producing means, and said cuvette box identification information produced by said cuvette box identification information producing means, corresponding to each other~~ box on which said second bar code is affixed. The corresponding information is stored in said memory means is provided.

[0023] ~~According to the present invention relating to claim 6, the identification information can be further increased since the second bar code in which the cuvette box identification information is entered is affixed on the cuvette box storing a plurality of cuvettes, and the read cuvette identification information and the read cuvette box~~The cuvette box identification codes and the cuvette identification information are correlated when stored in the memory means~~, corresponding to each other. Then, the number~~. Thus , the identification information can be further increased. The number of different possible code combinations capable of identifying ~~cuvettes~~and distinguishing one cuvette from another is further increased~~, and the~~. The identification of ~~each cuvette~~cuvettes can be ~~made perfect~~perfected.

~~[0024] The invention of claim 7 is controlling method, comprising:~~

[0025] ~~storing corresponding relation~~The invention can further support encoding, storing and relating further coded information ~~between~~identifying the blood products ~~information~~. Information obtained ~~by~~from a third bar code affixed on a blood products storing means ~~storing blood products and said cuvette identification information of said first bar code affixed on said cuvette obtained by said cuvette control unit as set forth in claims 1 through 6 in said memory means, when said~~can be used together with the cuvette encoding techniques and memory means as described, when processing and controlling blood products ~~is processed~~ using said cuvettes~~; and~~

~~[0026] controlling said blood products by said cuvette identification information.~~

~~[0027] According to the present invention relating to claim 7, blood products can be controlled on the basis of the cuvette identification information in a measurement operation since the corresponding relation information between the blood products information by the third bar code affixed on the blood products storing means and the cuvette identification information is stored in the memory means so as to control blood products by the cuvette identification information~~.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] FIG. 1 ~~is a view for showing~~shows a cuvette according to the present invention, (a) ~~is~~being a side view, and (b) ~~is~~ a view seen from arrow A of (a);

[0029] FIG. 2 is a view ~~for~~ showing an example of ~~a position on~~positions at which a bar code label ~~is~~can be affixed according to the present invention, (a) ~~is~~showing the bar code label of a cuvette, (b) ~~is~~ the bar code label of cuvette box, and (c) ~~is~~ the bar code label of blood products bag;

[0030] FIG. 3 is a view ~~for~~ showing an example of a cuvette control unit according to the present invention;

[0031] FIG. 4 ~~is~~shows a conceptual ~~view for showing an example of a~~ structure for using bar code;

[0032] FIG. 5 is a view ~~for~~ showing ~~ID corresponding~~an identification (ID) correlation table (~~ID corresponding~~or list), for registering cuvette ~~ID~~IDs and the like;

[0033] FIG. 6 is a flowchart ~~for~~ showing an ~~example of~~exemplary process ~~contents of~~ control program set in a computer;

[0034] FIG. 7 is a flowchart ~~for~~ showing an ~~example of process contents of~~exemplary subroutine for searching an ID ~~corresponding~~correlation table;

[0035] FIG. 8 is a flowchart ~~for~~ showing an ~~example of process contents of~~exemplary command selection subroutine;

[0036] FIG. 9 is a flowchart ~~for~~ showing ~~an example of process contents of~~ another command subroutine ~~1~~;

[0037] FIG. 10 ~~is a view for showing~~shows an example of the bar code label, (a) ~~is~~being a general bar code label ~~of~~ ID ~~in~~for a cuvette box, (b) ~~is~~ a bar code label of an ID ~~in~~for a cuvette box of the present embodiment and (c) ~~is~~ a bar code label ~~of~~ cuvette box ID;

[0038] FIG. 11 is a view for showing an example of a structure of the bar code, (a) ~~is~~being a code of ID in a cuvette box and (b) ~~is~~ a code of a cuvette box ID.

[0039] FIG. 12 is ~~an explanation~~a view for comparing the bar code label in straightened state and the bar code label in the state of being affixed on the cuvette ~~with each other~~, (a) ~~is~~being a top view and (b) ~~is~~ a view seen from arrow B of (a);

[0040] FIG. 13 is a block ~~view for~~diagram showing an example of a structure of the cuvette control unit according to the ~~present~~ invention; and

[0041] FIG. 14 ~~is a view for showing using~~shows an example when the contents of a code corresponding to the identification information INF of an ID in a cuvette box are entered with start code S, data code I and stop code P.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0042] Embodiments of the present invention will now be explained ~~hereinafter~~, referring to the drawings.

[0043] ~~A cuvette 1~~The invention is applicable to a conventional ~~one, and is the same as one explained~~ cuvette 1, as described above in the "BACKGROUND OF THE INVENTION". So, its explanation is ~~omitted~~not repeated here (see FIG. 1). FIG. 2(a) is a view for showing an ~~example of a~~exemplary position of a first bar code 5 ("bar code label" hereinafter) ~~to be~~ affixed on the cuvette 1. The bar code label 5 is affixed so as to wind ~~on~~around an outer periphery of the installation portion 2d of the lid ~~having~~, which has the maximum diameter ~~in~~found on the cuvette main body 2.

[0044] ~~FIG~~FIGS. 10(a) and (b) ~~are views for~~ each ~~showing~~shows an example of the bar code label ~~5~~5. (The numeric value in the figure shows ~~dimension, and its unit is mm~~)dimensions in mm.) The ~~place~~area for affixing the bar code label 5 on the cuvette 1 is limited ~~since~~, because the cuvette 1 is small in size.

[0045] The bar code label 5 is affixed on the outer periphery portion of the installation portion 2d of the upper lid, at the surface having the maximum diameter ~~since~~, because the contents of the bar code can not be seen if ~~it~~the label 5 is affixed on the body portion 2c of the cuvette 1 (see FIGS. 1 and 2). ~~Therefore, it~~It is inevitable ~~to make~~that the label must be small, ~~as a~~to carry a bar code, such as bar code label 5a as shown in FIG. 10(a).

[0046] FIG. 12 is a view ~~for explaining contrast~~showing the difference between the bar code label in a straightened state and the bar code label affixed on the cuvette, (a) ~~is plane~~being aplan view and (b) ~~is~~being a view seen from arrow B ~~of~~in (a). The installation portion 2d of the lid of the cuvette 1 is a circular shape seen ~~from plane~~in plan view, as shown in FIG. 1(b). If a general bar code label 5a ~~of~~as shown in FIG. 10(a) is affixed on the installation portion 2d of the lid and a bar code label 5b affixed on ~~a circle~~the circular shape is projected ~~on a plane is~~and seen in elevation from the side, in the direction as shown by the arrow A, ~~it is made small in~~the label is foreshortened on the right and left ~~direction~~sides as shown in FIG. 12 in comparison with the straight bar code label 5a. For this reason, the effective code reading ~~quantity~~breadth with respect to margin portions 5c ~~of~~at the right and left of the bar code label 5a, is decreased~~, and then~~,. This makes it ~~is~~ difficult to read the bar code label 5a ~~for~~using a bar code reader 14.

[0047] ~~Then, as~~As shown in FIG. 10(b), margin portions 5d of 12 mm are provided ~~with~~on the exemplary bar code label ~~5 so that the~~5. The label ~~has a size longer~~can have a span greater than half of the ~~round~~circumference of the installation portion 2d of the lid (~~the longest if it is seen from the side) by~~in elevation view the part of the view occupied by the label is relatively larger than when considering the curved circumference) by generally making the margin portion 5c ~~of~~longer than 5 mm ~~in general case~~. A longer~~. By doing so, the~~ bar code label 5a ~~can~~may be more easily read ~~when it is read~~ with the bar code reader ~~14.~~14, except for the matter of the curve.

[0048] FIG. 2(b) is a view for showing an example of a position of a second bar code ("bar code label" hereinafter) 7 which is affixed on a cuvette box 6, and FIG. 10(c) is a view for showing an example of the bar code label 7. ~~In the~~The cuvette box 6 can be made with corrugated cardboard ~~box~~ or the like, and carries twelve (12) rows of cuvette stands ~~9 are entered.~~9. On each cuvette stand 9, eight (8) cuvettes 1 are ~~put~~arranged in a row. ~~Then,~~There are thus twelve (12) rows~~.times.~~ x eight (8) cuvettes per row = ninety six (96) ~~of~~ cuvettes 1 ~~are entered~~ in the cuvette box 6. The bar code label 7 is affixed on the outside~~, the~~ upper portion or otherwise on the outer periphery ~~portion~~ of the cuvette box 6.

[0049] FIG. 2(c) ~~is a view for showing an example of a position of~~shows an exemplary third bar code ("bar code label" hereinafter) 13 affixed on a blood products bag 10 (bag shape) or 11 (bottle shape). The bar code label 13 is affixed on the surface of the blood products bag 10 or 11.

[0050] FIG. 3 ~~is a view for showing~~shows an example of a cuvette control unit ~~19 according to the present invention.~~19. The cuvette control unit 19 has reading means ("bar code reader" hereinafter) 14, which is a known electronic ~~equipment~~device, a micro-leukocytometer 17 and a computer 15, as shown in FIG. 3. The bar code reader 14 and the micro-leukocytometer 17 are connected with the computer 15 via connection cables 18, 18. ~~On~~In this ~~occasion~~example, the first reading means and the second reading means use the same bar code reader ~~in the present embodiment. But~~, but a plurality of bar code readers may be used instead.

[0051] FIG. 13 is a block diagram ~~for~~ showing an ~~example of a structure in the~~exemplary computer ~~of~~system for the cuvette control unit. As shown in FIG. 13, a main control portion 100 is provided with the computer 15. With the main control portion 100, a keyboard 101, a monitor 102, a program execution portion 103, an input judging portion 104, a reader control portion 105, a bar code judging portion 106, a registration execution portion 107, a table storing portion 108, an ID searching portion 109, a measurement control portion 110, and an information producing portion 111 are provided. An ID command list 103a is held by the program execution portion 103. Besides, an ID corresponding table (ID corresponding list) TB is stored in the table storing portion 108, and the bar code reader 14 is connected with the reader control portion ~~105 being free~~105, which is arranged to control the bar code reader.

[0052] FIG. 4 is a conceptual view ~~for~~ showing an example of ~~a structure for using~~how the bar code is used. As mentioned before, the bar code label 7 is affixed on the cuvette box 6, and the bar code label 5 is affixed to the cuvette 1. ~~Bar~~A bar code CA capable of ~~becoming~~encoding at least ninety six (96) ~~kinds of~~distinct values (i.e., ~~equal to~~ the number of the cuvettes 1 ~~to be entered in~~from one cuvette box 6 ~~is shown~~that are to be distinguished from one another) appears on the bar code label 5 to be affixed on each cuvette 1. This value of the bar code CA ~~is for indentifing~~identifying each cuvette 1

in each cuvette box 6, ~~and is named "ID in cuvette box", and~~ is the value, ~~such as~~for example, "a1a", "a1b", . . . "c8d," ~~, for instance, as~~ shown in FIG. 4. Bar code CB is capable of ~~becoming~~encoding n (or more) ~~kinds of~~ values~~, the same as~~ (where "n" is the total number ~~(number is n) of the~~ cuvette boxes 6 to be ~~used is shown on~~distinguished from one another using the bar code label 7 ~~to be~~ affixed on the cuvette box 6. ~~This~~The value of ~~the~~ bar code CB ~~is~~ for ~~indentifing~~identifying each cuvette box, ~~and~~ is ~~named~~the "cuvette box ID", and is the value, such as "000000001", "000000002", "000000003". . . "n", for instance, as shown in FIG. 4. Similarly, the bar code CA is the "cuvette ID." That is, ninety six (96) (the number of encoded cuvettes in each box)~~.times.~~ x n (the total number of distinguishable boxes)~~--96.multidot. n~~ defines the number of cuvettes can be indentified and distinguished by ~~combining~~ the bar codes CA and CB used together with each other in ~~stories~~a hierarchy as shown in FIG. 4. ~~On this occasion,~~Thus, a unique cuvette data ID is provided by the combined ~~the ID in~~ cuvette ~~box~~ID (the bar code CA) and ~~the~~ cuvette box ID (the bar code CB)~~ with each other for identifying 96.multidot.n of~~. The combined ID distinguishes 96 x n cuvettes 1 ~~is made~~(the CUVETTE ID~~(~~) each corresponding to a record ~~No.~~number in the table mentioned hereinafter~~)~~ . The value of the bar code shown on the bar code 13 of the blood products bag 10, 11 is its blood products information ("products ID" hereinafter).

[0053] ~~With this structure~~As thus arranged, an operation is executed as follows. FIG. 6 is a flowchart for showing an example of the process ~~contents~~steps of the control program, set in the programming of computer 15.

[0054] A tester inputs a start command ~~of~~to commence the control program through the keyboard 101 of the computer 15 ~~and~~or the like. ~~This~~The start command ~~is transferred~~transfers execution to the main control portion 100. ~~Receiving this, the~~The main control portion 100 instructs the program execution portion 103 to execute the control program~~. By doing so, the program execution portion 103 starts~~ and commences the control program (see FIG. 13). At ~~the time of start,~~startup, a predetermined initial process routine, such as the initialization of parameter~~,~~ values (shown with "FIRST" in FIG. 6) is executed (step S1).

~~[0055] <Registration of cuvette ID>~~ [0056] ~~At~~As a first step, a cuvette ID is registered. ~~That is, a~~A tester ~~gets~~causes the bar code reader 14 to read a predetermined bar code (not shown) (such as a bar code for a registration ~~comannd~~command). The ~~read~~code information is input by the reader control portion 105. ~~On the other hand, the~~The input judging portion 104 ~~judges~~determines whether or not there is any input of information (step S2). When there is ~~the~~an input of information, ~~as to whether or not this~~the information is ~~by bar code input is judged (step S3). In this case, this~~judged to determine whether or not it is a valid bar code input (step S3). In the case that the information is a valid bar code input, ~~so~~ the program enters ~~in~~ step S4 via step S2 and step S~~3 of~~3. See FIG. 6.

[0057] ~~That is, the~~The bar code judging portion 106 ~~judges as to~~determines whether or not the information input ~~by~~at the bar code input is ~~the~~a bar code command (step S4). As mentioned before, a predetermined bar code ~~(~~value (e.g., bar code ~~for~~ command or bar code data) was read by the bar code reader 14. ~~Then, the~~The bar code judging portion 106 judges whether this is the bar code command. ~~Receving the judged result~~Upon receiving a determination that the data is a bar code command, the program execution portion 103 executes command selection sub-routine (step S5).

[0058] FIG. 8 is a flowchart ~~for~~ showing an example of ~~the process contents of the command~~a command selection subroutine. The bar code judging portion 106 ~~judges~~determines whether or not the information ~~judged as the bar code command~~found is registered ~~command~~ as a command, and interprets the information by referring ~~the~~to an ID command list 103a ~~holding~~stored in the program execution portion 103 ~~in advance~~beforehand (step S51). In ~~this~~the case that the information is~~registered, this was registered command, then, the bar code judging portion 106 judges this is the registration command, and~~ the program proceeds with the following step S52.

[0059] FIG. 5 is a view ~~for~~ showing ~~ID corresponding~~an ID correspondence table for registering a cuvette ID ~~and~~or the like. ~~That is, the~~The registration execution portion 107 calls the table TB as shown in FIG. 5(a), stored in the table storing portion 108, and judges the possibility of inputting a record to the table TB. In the present embodiment,

an input pointer (not shown) is produced to identify a position in the table TB ~~by receiving~~, from the value of the cuvette box ID. ~~Therefore, the judgement~~A judgment as to whether or not the above-mentioned record can be input is done ~~as the judgement as to whether or not~~similarly for a cuvette ID of a cuvette box ID ~~is input~~ (step S52).

[0060] When ~~the judgement~~a judgment is made that a cuvette box ID has not been input ~~due to just after~~ but is needed to start registration ~~start is done, ,~~the registration execution portion 107 outputs a request ~~of inputting~~forinputting a cuvette box ID (step S53). This request is executed by displaying a message through the monitor 102, for instance. Responding to this request, ~~a~~the tester ~~gets~~causes the bar code reader 14 to read the bar code label 7 of the cuvette box ~~6 (when all registration finishes~~6. When all the registrations are finished, a command ~~of~~for registration finish is read and input ~~in place~~instead of ~~reading the~~a bar code label 7 of ~~the~~a cuvette box ~~6 at this time).~~6. The program enters ~~in~~ step S55 ~~since~~if the command ~~of finish of all~~for registration finish is not input at step S54.

[0061] ~~That is, the read~~The information that was read is input through the reader control portion 105, and ~~the input information is~~appropriately stored in a predetermined field of the table TB of the table storing portion 108 by the registration execution portion ~~107~~107, namely as a cuvette box ID (step S55). In FIG. 5(a), for instance, the cuvette box ID which is "000000001" is the datum stored ~~in the item of~~for "cuvette box ID" ~~of~~in the table TB.

[0062] When the cuvette box ID is ~~thus~~ input, the program enters ~~in~~ step S52 again, as shown in FIG. ~~8, and the judgement the~~8. The cuvette box ID ~~is input is~~steps having been done~~. Then~~, the registration execution portion 107 requests ~~to input ID in~~input to correlate the cuvette box ~~and~~ID with a products ID (step S56). This request is done by displaying message through the monitor 102, for instance. ~~On the other hand, at this time,~~Meanwhile, hemolysis ~~.TM.~~™ fluorescent dyeing reagent has been injected into each cuvette 1. Furthermore, ~~the~~ blood extracted from the blood products is ~~entered in~~injected into each cuvette 1 so as to mix. ~~That is, ID in cuvette box and products ID are input at this mixing time of the blood.~~

[0063] ~~A~~The tester ~~gets~~causes the bar code reader 14 to read the bar code label 5 of ~~the~~a cuvette 1, and to read the bar code label 13 of ~~the~~a blood products bags 10, ~~11 of~~11, namely the bag from which the blood products are taken to be mixed in the cuvette 1. The ~~read~~ information that is read is input through the reader control portion 105. Of the bar code input, the bar code CA of the bar code label 5 of the cuvette 1 is input in the information producing portion 111.

[0064] ~~Producing~~Operation of ~~information in~~ the information producing portion 111 will now be explained ~~hereinafter~~.

[0065] FIG. 11 ~~is a view for showing~~shows an example of a structure ~~of~~for the code of the bar code label 5 or 7. The character S in the figure ~~shows~~is a start code (one of four signals a, b, c, d) ~~,~~; C and C~~, C~~1 through C9 ~~show~~represent a data code (~~signal is~~e.g., digits 0 through 9)~~,~~; D ~~shows~~is a check digit (~~signal is~~a value determined by calculation)~~,~~; P ~~shows~~is a stop code (one of four signals, a, b, c, d) ; and, and the part shown by I is ~~one of~~a data code~~, and one shown~~ or flag for information contents. Ninety six (96) ~~kinds of~~distinct codes ~~should be prepaired for~~are provided on the different bar code ~~label~~labels 5 to be affixed ~~on the cuvette 1 since~~respectively to the cuvettes 1, because there are ninety six (96) cuvettes 1 ~~are~~ in one cuvette box ~~6.~~6, to be distinguished by their cuvette IDs.

[0066] Three ~~kinds of codes,~~categories of digits are provided, in addition to content codes such as numbers, namely the start code S, the check digit D and the stop code P. These start/stop/check categories are generally necessary for bar code, in addition to the data code ~~I showing~~representing information ~~contents~~content. Since an encoding capacity of ninety six (96) ~~kinds~~ distinct codes (or more) is necessary for the data content code, 2 decimal digits (characters) ~~(10.times.10=100 kinds)~~ with decimal ~~number~~numbers zero to nine are necessary, at the minimum, for 100 distinct values. Then, the bar code has five (5) digits of code if the bar code label 5 is produced as usual. But, in that case the bar code ~~having~~has five (5) digits (characters) of code ~~can not be affixed since the place~~. It may not be possible to use so large a label, because the space for affixing the bar code label 5 ~~of~~on each cuvette 1 is small. ~~Then,~~According to the invention, a bar code label 5 having a total of four (4) digits (characters) of bar

code is provided, with only one (1) digit of data ~~code is affixed on each cuvette 1, and~~content code. Nevertheless, sufficient encoding capacity of cuvette identification information is made available for identifying ninety six (96) ~~of~~distinct cuvettes ~~1 is produced by the information producing portion 111 from the~~1, from a total of only four digits of bar code. ~~That is, information is produced~~This is accomplished as follows.

[0067] FIG. 14 ~~is~~shows a ~~view for showing~~ usage example when the ~~contents of the~~ code corresponding to the cuvette identification information INF (the cuvette IDs of ~~ID~~cuvettes in one cuvette box ~~is shown with~~) consists of a start code S, a data code I, and a stop code P. If the start code or leading digit of ~~first~~a line ~~digit of the~~ bar code from a label 5 ~~affixed~~ on ~~the~~a cuvette 1 is read by the bar code reader 14 ~~is~~as an "a",, the start code has a data ~~code is "1" and~~value, e.g., "1." If the stop code is "a",, for instance, as shown in FIG. 14, the information producing portion ~~regards~~interprets the start code "a" and the stop code "a" as part of the data code in addition to the data code "~~1~~1," so as to produce ~~the~~ identification information "a1a" from ~~these~~the three (3) ~~digits~~digit code. If the start code of the bar code of the cuvette 1 subsequently read is "a",, the data code is "1" and the stop code is "b",, the information producing portion ~~111~~ produces "a1b,". ~~And~~ and so forth~~, the~~. The cuvette identification information INF comprised of three (3) digits (characters) of data code is produced from four (4) digits (characters) of bar code shown on the bar code label 5 concerning ninety six (96) of cuvettes 1, ~~regarding~~with start ~~code~~codes and stop codes contributing to the data code as ~~data code~~described. The cuvette identification information INF concerning each cuvette 1 is thus produced as shown in FIG. 14.

[0068] ~~That is,~~The start/stop codes can be detected ~~if~~although optional ~~one~~ digit (character) values of "a" through "d" ~~is~~are used for start code S and stop code P. ~~So,~~ That is, four kinds of start code "a" through "d" and four kinds of stop code "a" through "d" are also used as part of the data code. In this way, ~~thereby~~ the capacity of one decimal digit can be increased up to ~~4.times.10.times.4=160 kinds with the same~~4 x 10 x 4 = 160 distinct values, using four digits (characters) of bar code ~~if actual~~and wherein the numeric data code I has one digit (character) ~~(~~. In the ~~present~~disclosed embodiment, ~~the~~a capacity of more than 96 ~~kinds~~variations is ~~not~~more than what is

necessary~~, so the~~. The he capacity ~~is~~could be made 4 ~~.times.8.times.4=~~x 8 x 4 = 128 kinds using the numerals "1" through "8" for data code I).

[0069] As ~~mentioned before, the code of~~described, without loss of encoding capacity, the bar code label 5 can be changed ~~into four digits (characters)~~ from five digits (characters) to to four by ~~producing~~providing information ~~using~~wherein the start code and stop code also function partly as data code. ~~Then, one digit can be decreased, more cuvettes~~Thus, the bar code label size is reduced by a digit. Cuvettes 1 capable of ~~identifying~~being encoded by bar code ~~can be prepared, and the~~are facilitated. The bar code label can be affixed to a limited ~~place~~area, such as the limited area available on the cuvette 1.

[0070] As shown in FIG. 11(b), the bar code label 7 of the cuvette box ID ~~is~~can be used ~~as a general~~in the known way ~~since~~, because the label size is not unduly limited~~, as mentioned before, then twelve~~ by the size of the box. Twelve (12) digits of bar code label can be used, in which nine (9) digits are data ~~code is used. By doing so,~~content code. This provides the code of bar code label 7 ~~can have the~~with a capacity of ~~10.sup.9 kinds (~~10^9 distinct possible values to be used for cuvette box identification information~~)~~.

[0071] ~~That is~~In that embodiment, the capacity of the cuvette ID ~~is the kinds of 128.times.10.sup.9~~together with the box ID is 128 x 10^9 in total~~, and the~~. The same number of cuvettes 1 can be ~~measured by~~distinguished using the ~~present~~ cuvette control unit ~~19.~~19 as described. As mentioned above, the capacity of the bar code CA of ~~ID in~~the cuvette ~~box~~ID is ~~possible~~easily moved up to 160 (one hundred and sixty) ~~kinds~~values by producing the cuvette identification information INF~~, and~~. There is no specific limit ~~is for~~on the cuvette box identification information INF ~~whcih~~which is the capacity of the bar code CB ~~of~~on the cuvette box~~ID. Then, easy dealing is possible even if the number of the~~. By providing more than the minimum number of possible data encoding values, the number of cuvettes to be processed ~~is~~at one time can be increased later.

[0072] ~~As mentioned above, the~~The information producing portion 111 produces the cuvette identification information INF from the start code S, the stop code P and the information code I of the bar code CA (the bar code CA input by the bar code reader 14 is input in the information producing portion 111 so as to produce ~~it as~~ the cuvette identification information INF~~, hereinafter) so as to~~). This information is input in the ~~,~~ registration execution portion 107. The registration execution portion 107 refers to the table TB ~~of~~in the table storing portion 108 (~~concerning~~to the record ~~having~~also corresponding to the cuvette box ID, which input ~~is~~was judged at step S52 just before) ~~and judges as to~~. The registration execution portion determines whether or not the ~~ID in~~ cuvette box ~~shown by~~ID or the ~~input~~ cuvette ~~identification information INF~~ID just input has been already registered (step S57) . If already registered, error processing is performed ~~since it is the~~because a second registration to the same ~~cuvette (step S58) and~~ID is being attempted. An error message or the like is displayed through the monitor 102 or the like. If no registration is judged in step S57, the registration execution portion 107 stores ~~ID in cuvette box (cuvette identification information INF) and~~the cuvette ID with the box ID and the blood product ID in respectively predetermined fields in the records ~~wherein~~, indexing with the input pointer ~~is~~ produced for referencing data in table TB (step S59). At the same time, a registration flag ~~of record~~ is ~~made~~set to "~~1~~1," which ~~shows~~indicates "already registered." (Not yet registered is ~~made~~indicated by "0".)~~.~~ In FIG. 5(b), for instance, in the first record of table TB, the cuvette identification information INF (cuvette ID in cuvette box storage area)"a1a" is stored in the item ~~of~~for "cuvette ID in cuvette box~~,~~", ~~the~~ The products ID "0000000001" is stored in the corresponding item of "products ID"~~ and~~." A flag is set to "1" ~~is stored~~ in the item of "registration flag"~~, respectively~~."

[0073] The values have been thus registered in the fields of cuvette box ID, cuvette ID in cuvette box, and products ID ~~in~~, are associated as one record. As shown in FIG. 5(b), the key item for identifying respective records, which is also the record ~~No.~~number, is the cuvette ID. That is, registration of one cuvette ID finishes.

[0074] Subsequently, the registration execution portion 107 ~~judges as to~~determines whether or not the registration of ~~ID in~~ cuvette ~~box~~IDs in ~~the same~~ cuvette

box 6 has been finished on the basis of input by the bar code reader 14 or the keyboard 101 (step S60). If not finished, the program returns to step S56, again. By repeating above-mentioned steps S56 through S60 in order, the cuvettes 1 of the ~~same~~particular cuvette box 6 are registered in order. When the program returns to step S56 from step S60, the input pointer in table TB is ~~moved~~indexed to the next record ~~one~~in line ~~under~~ (see FIG. 5)~~, and the same value as one of the above line of record is input in the cuvette box~~. The same cuvette box ID value is copied from the previous line and correlated with the new cuvette ID ~~in the record~~value.

[0075] When registration ~~thus finishes to all of~~is completed for the ninety six (96) ~~of~~ cuvettes 1 in the ~~same~~give cuvette box ~~6~~6, and the program proceeds with step S60, ~~finish of~~ registration of ~~ID in~~cuvette IDs for the cuvette box is ~~judged on the basis of~~considered finished. This is determined from the input by the bar code reader 14 or the keyboard 101. ~~Then, the~~The program returns to step S52, again, ~~and all of n of~~to the next cuvette box. All n cuvette boxes 6 ~~is~~are registered by repeating the above-mentioned steps S52 through S60 in order.

[0076] ~~As mentioned above, the registration of n.times.96=96.multidot. n of cuvette ID is all finished. In the state that registration all finished, the command of registration finish~~When n x 96cuvette IDs are finished, no further registrations are needed. A command indicating that the registration phase has finished is read and/or input ~~in place~~, instead of reading the bar code ~~of the~~from another cuvette box 6 (operation input D1). The ~~input of all registration finish command is judged in step S54, the program gets out of~~program exits the subroutine for command selection. ~~When~~With step S6 ~~is~~ thus finished, the program returns to step S~~2, again. [0077]~~

~~<Measurement>~~2.

[0078] ~~As mentioned above, n.times.96=96 .multidot. n of cuvettes 1 wherein registration of cuvette ID is finished~~The registered cuvettes (n x 96) are centrifuged, and the measurement of ~~these~~the cuvettes 1 is executed via the micro-leukocytometer 17 in the following way.

~~[0079] [{circle over (1)} Input of products ID]~~ [0080] A tester ~~gets~~causes the bar code reader 14 to read the bar code label 7 of ~~the~~a cuvette box 6 and the bar code label 5 of ~~one~~a cuvette 1 of the cuvette box 6.

[0081] ~~Then, the~~The input judging portion 104 judges that information is input (step S2), as shown in FIG. ~~6, and~~6. Furthermore, input portion 104 judges that the information is bar code input (step S3). The bar code judging portion 106 judges that the information input by bar code input is not a bar code command (step S4), and that ~~this~~the information is a cuvette ID (~~it means~~meaning the combination of a cuvette box ID and a cuvette ID in the cuvette box ~~in this case~~) (step S6). ~~And, the~~The program proceeds with step S8 ~~which is~~to search the ~~subroutine for searching ID corresponding~~ID correspondence table. ~~When no~~If the cuvette ID is ~~judged~~not found in step S6, error processing is performed (step S7), and the program returns to step S2~~, again~~.2.

[0082] FIG. 7 is a flowchart for showing an example of the process ~~contents of subroutine for~~ searching ~~ID corresponding~~the ID correspondence table. When the program enters into the subroutine for searching ~~ID corresponding~~the ID correspondence table of step S8, the main control portion 100 instructs the ID searching portion 109 to search ~~ID. Receiving this, the~~for the subject cuvette and box ID. The ID searching portion 109 searches table TB ~~with~~, in which the cuvette ID (the combination of cuvette box ID and ID in cuvette box) ~~judged~~is stored. The subroutine in step S6 ~~as a key, and~~ judges ~~as to~~ whether ~~or not~~ the record having the corresponding cuvette ID exists, that is, ~~as to~~ whether or not the cuvette ID has been registered (step S81). ~~When~~If the ~~judgement is that no corresponding~~ record ~~exists, and that no cuvette ID is registered~~is not found , error processing is performed (step S82), and the program ~~gets out of~~exits the subroutine ~~so as~~ to return to step S2, ~~as~~ shown in FIG. 6.

[0083] When the record having the corresponding cuvette ID is ~~searched in~~found by searching the table TB in step S81, ~~the judgement is that~~and the cuvette ID has been registered ~~so as~~, the correspondence table TB also can be consulted to obtain the corresponding products ID included in the record searched (step S83). The ~~obtained~~ products ID thus found is displayed on the monitor 102 or the like (step S84). Watching

this display, an operator confirms the products ID. At the same time, the products ID obtained in step S83 is directly transferred to the micro-leukocytometer 17 through the connection cable ~~18 in addition to displaying on the monitor 102 so as to input.~~18.

[0084] When the products ID is ~~thus obtained so~~sent as ~~to~~an input ~~in~~to the micro-leukocytometer 17, the program ~~gets out of~~exits the subroutine for searching ~~ID corresponding~~the ID correspondence table ~~so as to return~~and returns to Step S2, ~~as~~ shown in FIG. 6.

[0085] ~~On this occasion,~~It is possible to provide the products ID ~~can be manually~~by manual input through the keyboard ~~101 or the like~~101, rather than scanning a code. When the products ID is manually input through ~~the~~a key board 101 or the like, for instance, the input judging portion 104 ~~judges~~determines that the information ~~is~~has been input (step S2), ~~and judges~~ that the information is not bar code input (step S3), as shown in FIG. 6. ~~And~~In that case, the products ID input by an appropriate keyboard input subroutine (step S9) is transferred to the micro-leukocytometer ~~17 as it is so as to input.~~17.

~~[0086] [{circle over (2)} Measurement with machine]~~ [0087] After the products ID ~~concerning~~for the cuvette 1 to be measured is input ~~in~~into the micro-leukocytometer 17, ~~a~~the tester initiates a measurement. For example, the tester ~~gets~~causes the bar code reader 14 to read a predetermined bar code (the bar code ~~for measurement~~indicating a command to commence measurement) (not shown). As shown in FIG. 6, the input judging portion 104 ~~judges~~determines that the information is input (step S2) and ~~judges that the information is the~~is bar code input (step S3). ~~The bar code judging portion 106 judges that the information input by bar code input is~~ and is a bar code command (step S4), ~~and~~whereupon the device executes the command selection subroutine (step S5).

[0088] As shown in FIG. 8, in the command selection subroutine, the input command is not found to be the registration command, but instead is the measurement command, ~~so the judgement is~~. The determination that ~~it~~the input is not a registration

command (step S51)~~, and another~~ causes execution of a different command subroutine 1~~ is executed~~ (step S70).

[0089] FIG. 9 is a flowchart ~~for~~ showing an example of process ~~contents of~~steps in another command subroutine 1. The bar code judging portion 106 ~~judges as to whether or not~~determines that the information ~~judged that it is not registration command is~~is a measurement command by referring to the ID command table 103a~~ held~~, stored in advance by the program execution portion 103 (step S701). ~~In this case, it is measurement command. So, the bar code judging portion 106 judges that it is measurement command, and the~~The program proceeds with the following step S702. If the ~~judgement is~~judging portion 106 determines that ~~it~~the information is not measurement command, the program proceeds with another command subroutine ~~2 since it is further~~2. In the preferred embodiment the different command leads a another subroutine (step S80~~: Detailed explanation is omitted since it~~) that is not ~~related~~pertinent ~~to the point of~~ the present invention.~~)~~.

[0090] When the program ~~enters in~~reaches step S702, the measurement control portion 110 communicates with the micro-leukocytometer ~~17 side,~~17, and judges ~~as to~~ whether or not a measurement ID is input. The measurement ID is comprised of the product ID input by the above-mentioned ~~[{circle over (1)} Input of products ID] and another~~technique, and certain measurement conditions (input in the micro-leukocytometer 17 in advance). When the ~~judgement~~judgment is made that the products ID has not yet been input~~ and then~~, the measurement ~~ID has not been yet input,~~ step cannot proceed, and error processing is performed (step S703)~~ since measurement can not be executed. Then, the~~. The program ~~gets out of~~exits the subroutine.

[0091] ~~The~~If the products ID ~~is input by [{circle over (1)} Input of products ID] here, and the judgement is that the products ID is input. Then~~has been input, the program proceeds with step S704. ~~That is, the~~The measurement control portion 110 ~~judges as to~~determines whether or not the products ID has been measured by referring to table TB. This ~~judgement~~judgment is ~~executed~~made on the basis of the measurement flag ~~(mentioned hereinafter)~~ provided in table TB. When the

~~judgement~~judgment is made that the products ID has been already measured in step S704, error processing is performed (step S703) since it is not necessary to execute another measurement. ~~Then, the program gets out of~~The program exits the subroutine.

[0092] When the ~~judgement~~judgment is made that the products ID has not yet been measured in step S704, the measurement flag of the record having the corresponding products ID in table TB is ~~made~~set to "1" which ~~shows~~indicates "already measured" ("not yet measured" is "0") by the measurement control portion 110 (step S705). Subsequently, the program proceeds with a predetermined measurement subroutine (step S900). In this measurement subroutine, for instance, the measurement control portion 110 allows the micro-leukocytometer 17 to measure.

[0093] ~~Then, a~~The tester operates the micro-leukocytometer 17 so as to execute predetermined ~~measurement~~measurements. The measurement result is ~~properly~~ displayed and recorded on the micro-leukocytometer 17 or in the computer 15. After step S900, the program ~~gets out of~~exits another command subroutine 1, and step S70 finishes, as shown in FIG. 8. ~~And, the program gets out of the command selection subroutine, and~~ control returns to step S2 from step S5, as shown in FIG. 6.

[0094] ~~Then,~~When the measurement of one cuvette 1 finishes. ~~Thereafter, concerning remaining cuvettes 1, a~~, the series of procedures is repeated for successive cuvettes in order in such a manner that the products ID is input in the micro-leukocytometer ~~17 by [{circle over (1)} Input of products ID] and measurement is executed by [{circle over (2)} Measurement with machine]. By doing so,~~17, and measurements are taken. By continuing, the measurement phase finishes ~~concerning~~for all of ~~96.multidot.~~96 x n ~~of cuvettes 1.~~.

[0095] According to the ~~present~~ cuvette control unit ~~19, all of~~19 as described, various operations, such as ~~keyboard~~ input which has formerly been manually executed, by keyboard, and correspondence between cuvette ~~ID~~IDs and products ~~ID~~IDs which has been manually ~~written, is~~accomplished in writing, are executed ~~by~~using a bar code system. Since the input in the computer 15 is executed ~~by~~using bar code, the input of ~~ID~~IDs of 10 digits ~~including blood~~, for example identifying ablood collecting center

where blood is collected, a place where blood is collected, a serial number and the like ~~as~~for the blood products ID, for instance, is made easier than possible with manually input.

[0096] ~~Besides, troublesome operation is unnecessary without executing troublesome operation, such as~~The required operations are not troublesome, compared to the operation of ~~manually~~manual entry of ID number ~~in the cuvette 1~~on cuvettes with ~~a~~ marking ink, the operation of ~~manually~~manual entry of ~~the~~ corresponding ~~between the~~ cuvette ~~ID~~IDs and ~~the~~ blood products ~~ID~~IDs in a notebook ~~or the like~~, etc. particularly for many cuvettes 1. ~~Therefore,~~The burden of such measurement ~~operation~~operations is reduced~~, and mental~~. Mental stress and physical pain ~~given to a~~for the tester ~~is made~~are smaller. ~~Besides,~~Furthermore, input ~~error~~errors and repeating the same ~~measurement twice~~measurements two or more times, as frequently occurred in the past, can be avoided ~~since input in the computer 15 is made by bar code~~.

[0097] ~~Even if a~~The tester ~~takes out the~~need not carefully handle each successive cuvette 1 ~~regardless of the order so as to register and to measure,~~in order when registering and measuring. The results of registration and measurement ~~can be obtained so as to~~ correctly correspond ~~to each other~~ without laborious checking of a notebook or the like ~~since~~, because the correspondence is performed by the computer ~~15 (But, ID in~~15. All that is necessary is to register the cuvette IDs in each cuvette box and the products ~~ID should be~~IDs, preferably simultaneously ~~registered at the time of registration.)~~.

[0098] ~~Furthermore, bar code~~The table ~~of bar~~ofbar code ~~command~~commands is prepared for scanning in addition to bar code ~~of ID number for~~ID numbers scanned as the ~~bar~~data code input ~~system of~~to the ~~present~~ cuvette control unit 19. ~~Then,~~In this way, many necessary ~~many~~ commands, such as ~~registration, measurement, storing of measuring result, storing of image data, printing,~~commands to register, measure, store results, store image data, print, the setting of various values, referring to sources of help, are possible without using a keyboard or a mouse. ~~Therefore, a~~The tester can ~~measure~~proceed using only ~~with~~ the bar code reader ~~14~~14, without changing from one

input ~~by a keyboard or a mouse, without passing thing from one~~ device or even one hand to the other.

[0099] In ~~another~~an alternative embodiment, another bar code reader can be provided, for example with ~~the portion of~~ the micro-leukocytometer 17 where the cuvette 1 is ~~set. Firstly~~placed for measurement. First, the cuvette box ID is read in ~~advance so as to set an optional~~. A cuvette 1 is selected and set on the measurement machine 17. ~~Then, ID in~~ The cuvette ID in the cuvette box (e.g., one of 96) is read by the bar code reader in the measurement machine ~~17 is searched~~17. The cuvette and box IDs permit a search by the computer 15 ~~and~~for the products ID ~~is obtained so as to start measurement~~. After the measurement, the product ID and measurement result are ~~input~~available in the computer 15, corresponding to each other. By operating thus and as mentioned before, the burden ~~of a~~on the tester ~~in measurement operation can be~~is further decreased.

[0100] Ninety six (96) of cuvettes 1, for ~~instance~~example, are ~~entered~~associated in ~~the~~a cuvette box 6. Then, ~~Ninety~~ninety six (96) ~~of kinds~~distinct values of the identification information INF, for instance, are necessary ~~for the cuvette 1 to prepare (to produce). In case where~~to distinguish the cuvettes in the box in preparation for measurement. If only forty (40) cuvettes 1, for ~~instance, are entered in the cuvette box 6,~~example, were associated, the cuvettes ~~1 can~~could be identified and controlled by ~~preparing (producing)~~providing for forty ~~kinds~~distinct values of identification information INF for the cuvettes ~~1. On this occasion~~. In that case, the number of ~~the~~distinct cuvette ~~identification information INF is four (4) kinds of code for controlling.times.ten (10) kinds of data code (0-9)=fourty (40) kinds~~identifications INF can comprise four (4) possible values of control codes and, e.g., a decimal digit providing ten (10) possible values of additional data code, resulting in forty (40) distinct values. This number of possible values is provided if either of the start code and ~~stop code of code for controlling is produced as code for information. Then, forty~~the stop code provides four possible values (or if each has two, etc.). Forty (40) cuvettes 1 can be identified and controlled. That is, up to forty (40) ~~or less~~ cuvettes 1 can be uniquely identified and controlled if one

of ~~both stating~~the two control codes (either the start code S ~~and~~or the stop code P) is used as a four value code carrier, without using both.

[0101] In a case where the cuvettes 1 have different size and shape~~, and~~ permitting different numbers of digits, other numbers of cuvettes can be controlled. For example, 1600 cuvettes ~~capable of affixing five digits of bar code thereon are~~that are large enough for five digit bar codes can be distinguished and identified~~, for instance, the~~. The number of the cuvette identification information INF is 4 kinds (a-d) of start code S ~~.times.~~x 100 kinds of data code I (0-99~~).times.~~ if decimal) x 4 kinds of stop code (a-d)~~=1600 kinds, then 1600 cuvettes can be identified and controlled by making the digit of the code for information of the bar code five digits (characteres) in total adding two digits. Therefore, for instance, 160 or more and 1600 or less cuvettes can~~, for a total of 1600 different values, permitting 1600 cuvettes to be identified and controlled by ~~making the~~using bar code of five digits ~~(characters)~~. [0102] The present invention is explained on the basis of the ~~embodiment~~embodiments heretofore as nonlimiting examples. The embodiments which are described in the ~~present~~ specification are illustrative ~~and not limiting~~. The scope of the invention is designated by the accompanying claims and is not restricted by the descriptions of the specific embodiments. Accordingly, all the transformations and changes ~~belonging to~~encompassed by the claims are included in the scope of the present invention.

~~CLAIMS~~

WE CLAIM:

~~1.~~ ~~Cuvette~~ 1(amended). A cuvette control unit for controlling cuvettes by reading a first bar code affixed on said cuvette, said first bar code being comprised of ~~codes for controlling~~at least one control code located on ~~both~~one of two opposite end portions of said first bar code, and ~~code for~~at least one information code located between said ~~codes for controlling~~opposite end portions, wherein said first bar code encodes a distinct value from among a plurality of possible values, said cuvette control unit comprising:

a first reading means capable of reading said first bar code~~;~~, the first reading means being operative to read said first bar code and being responsive to at least two different values of at least one said control code at one of said end portions, wherein the first reading means distinguishes among said at least two different kinds when reading the first bar code;

a cuvette identification information producing means ~~for~~responsive to the first reading means, the information producing means providing a cuvette identification code based on the information ~~corresponding to said cuvette on which said first bar code is affixed from said code for controlling and said code for information of said first bar code read by said~~code and also based on which of said different values of the at least one control code is read by the first reading means when reading said first bar code affixed to said cuvette; and

a memory means for storing ~~said~~ cuvette identification information ~~produced by said cuvette identification information producing means,~~ corresponding to said cuvette ~~on which said first bar~~identification code ~~is affixed~~.

~~2.~~2(amended). The cuvette control unit as set forth in claim 1, wherein said cuvette identification information producing means produces said cuvette identification information ~~corresponding to said cuvette on which said first bar code is affixed from start code of said codes for controlling and said code for~~from at least one said control

code comprising a start code at one of said end portions, in combination with said information code.

~~3.~~3(amended). The cuvette control unit as set forth in claim 1, wherein said cuvette identification information producing means produces said cuvette identification information ~~corresponding to said cuvette on which said first bar code is affixed from stop code of said codes for controlling and said code for~~from at least one said control code comprising a stop code at one of said end portions, in combination with said information code.

~~4.~~4(amended). The cuvette control unit as set forth in claim 1, wherein said cuvette identification information producing means produces said cuvette identification information ~~corresponding to said cuvette on which said first bar code is affixed from~~ from two said control codes comprising a start code at one of said ~~codes for controlling and~~end portions, a stop code at an other of said ~~codes for controlling~~end portions, and said ~~code for~~ information code.

~~5.~~5(amended). The cuvette control unit as set forth in claim 1, wherein said first bar code ~~is comprised of said codes for controlling comprised of~~comprises a start code and a stop code, ~~one digit of said code for~~on opposite ends of two digits consisting of one character of information and one ~~digit~~character of ~~code for~~ inspection code.

~~6. The cuvette control unit as set forth in claims 1 through 5 for controlling a plurality of said cuvettes stored in a cuvette box on which a second bar code is affixed, wherein a second reading means capable of reading said second bar code is provided, a cuvette box identification information producing means for producing cuvette box identification information corresponding to said cuvette box, on which said second bar code is affixed, from said second bar code read by said second reading means is~~

~~provided, and a storing control means for storing said cuvette identification information corresponding to said cuvette stored in said cuvette box, on which said second bar code is affixed, read by said second reading means, produced by said cuvette identification information producing means, and said cuvette box identification information produced by said cuvette box identification information producing means, corresponding to each other in said memory means is provided.~~

~~7. Controlling method, comprising:~~

6(amended). A cuvette control unit for controlling cuvettes by reading a first bar code affixed on said cuvette and at least a second bar code affixed on a box for carrying a plurality of curettes, said first bar code being comprised of at least one control code located on one of two opposite end portions of said first bar code, and at least one information code located between said opposite end portions, wherein said first bar code encodes a distinct value from among a plurality of possible values, said cuvette control unit comprising:

a first reading means capable of reading said first bar code, the first reading means being operative to read said first bar code and being responsive to at least two different values of at least one said control code at one of said end portions, wherein the first reading means distinguishes among said at least two different kinds when reading the first bar code;

~~storing corresponding relation information between blood products information obtained by a third bar code affixed on a blood products storing means storing blood products and said cuvette identification information of said first bar code affixed on said cuvette obtained by said cuvette control unit as set forth in claims 1 through 6 in said memory means, when said blood products is processed using said cuvettes; and~~a cuvette identification information producing means responsive to the first reading means, the information producing means providing a cuvette identification code based on the information code and also based on which of said different values of the at least

one control code is read by the first reading means when reading said first bar code affixed to said cuvette;

~~controlling said blood products by said~~a second reading means capable of reading said second bar code, and a cuvette box identification information~~.~~ producing means providing a cuvette box identification code based on the second bar code;

a memory means for storing cuvette identification information corresponding to said cuvette identification code and said box identification code; and,

a storing control means for storing said cuvette identification information in the memory means, wherein the cuvette identification information is correlated in the memory means to the cuvette identification code obtained from said information code combined with said at least one control code, and said cuvette box identification code.

Claim 7 is canceled, without prejudice.

New claim 8 is added.

8(new claim). A method of controlling cuvettes by reading bar codes affixed on said cuvettes, the bar codes representing digits of code, said method comprising:

respectively locating a code to be used for detecting start/stop of said bar code at both ends of said bar code affixed on each said cuvette;

selecting and using at least one code from among a plurality of start/stop codes respectively showing different values, as at least one of the codes at the ends of said bar code, used for detecting start/stop of said bar code;

identifying each said cuvette using a cuvette identification code comprising one of the different values selected for said at least one of the codes used for detecting start/stop of said bar code and also comprising a value of a code located at a portion between said ends of said bar code;

affixing to said cuvette the bar code showing the cuvette identification code; and,

reading said cuvette identification code and producing cuvette identification information for controlling a plurality of the cuvettes.

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CUVETTE CONTROL UNIT AND CONTROLLING METHOD USING THE SAME

Abstract

~~On both end portions of bar code CA to be affixed on a cuvette, there are codes for controlling, start code S and stop code P which are codes for detecting end portions. Identification information INF of each cuvette is produced, regarding the codes for controlling as code for information, together with original code for information I. Then, many cuvettes can be controlled with one digit of code for infomation I.~~

Cuvettes in boxes for blood testing and the like, are to be distinguished by bar code cuvette identification codes on each cuvette, together with a box identification code. The cuvettes have very limited space for bar code characters. The cuvette bar code reader is responsive to at least two different kinds of control codes, i.e., two distinct start code values and/or stop code values. The distinct control codes operate the bar code reader, but also contribute to the information that is encoded . A cuvette identification code is developed that combines an information code value with distinctions among the control codes found, to increase the number of values that can be encoded. In one embodiment, four start codes, four stop codes and a single decimal information digit, provide 160 different values.

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